## WHAT IS CLAIMED IS:

1. A method for screening for drugs for the treatment of Alzheimer's disease, said method comprising:

contacting mutant hippocampal cells having enhanced synaptic potentiation upon stimulation as compared to wild-type hippocampal cells with a candidate drug; subjecting said mutant cells to tetanic stimulation; and

determining the effect of said agent on the synaptic potentiation of said mutant hippocampal cells;

wherein a reduction in the enhanced synaptic potentiation of the mutant hippocampal cells is indicative of activity of a candidate drug for the treatment of Alzheimer's disease.

2. A method according to Claim 1, wherein said mutant cells are mutated in a presenilin gene.

3. A method according to Claim 2, wherein said mutant cells are mouse hippocampal tissue slices.

4. A method according to Claim 1, wherein said enhanced synaptic potentiation is as a result of a change in the GABA, receptor pathway.

5. A method for screening for drugs for the treatment of Alzheimer's disease, said method comprising:

contacting mutant hippocampal cells, having enhanced synaptic potentiation upon stimulation as compared to wild-type hippocampal cells, with a candidate drug;

subjecting said mutant and wild-type hippocampal cells to a tetanic stimulus; measuring changes in potentiation with time of the mutant and wild-type hippocampal cells and comparing the effect of said agent on the synaptic potentiation of said mutant as compared to the observed synaptic potentiation of said wild-type hippocampal cells;

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wherein a reduction\in the enhanced synaptic potentiation of the mutant hippocampal cells as compared to the synaptic potentiation of the wild-type cells is indicative of activity of a candidate drug for the treatment of Alzheimer's disease.

A method according to Claim 5, including the additional steps of: 5 6. contacting mutant hippocampal cells having enhanced synaptic potentiation upon tetanic stimulation as compared to wild-type hippocampal cells with a GABA receptor antagonist;

subjecting said mutant and wild-type hippocampal cells to tetanic stimulation;

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> measuring changes in synaptic potentiation with time of the mutant and wild-type hippocampal cells and comparing the effect of said GABA, receptor antagonist on said mutant and said wild-type hippocampal cells;

wherein a reduction in the enhanced synaptic potentiation of the mutant hippocampal cells without a significant change in the synaptic potentiation of the wild-type cells is indicative of the mutation acting on a common pathway with said GABA<sub>A</sub> receptor antagonist.

- A method according to Claim\5, wherein said agent is present with said wild-7. type hippocampal cells.
- A method for screening for drugs for the treatment of Alzheimer's disease, 8. said method comprising:

contacting mutant hippocampal cells having enhanced synaptic potentiation upon stimulation as compared to wild-type hippocampal cells with a candidate drug; subjecting said mutant and wild-type hippocampal cells to a tetanic stimulus at a first potential of glutamate currents and a second potential of GABA, currents;

measuring the synaptic response at each of the first and second potentials for the mutant and wild-type hippocampal cells and comparing the effect of said agent on said mutant and said wild-type hippocampal cells;

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wherein a reduction in the enhanced synaptic response of the mutant hippocampal cells without a significant change in the synaptic response of the wild-type cells is indicative of activity of a candidate drug for the treatment of Alzheimer's disease.

5 9. A method for screening for drugs for the treatment of Alzheimer's disease, said method comprising:

contacting mutant mouse hippocampal cells mutated in the presentiin-1 gene and having enhanced synaptic potentiation upon tetanic stimulation as compared to wild-type hippocampal cells with a candidate drug;

subjecting said mutant and wild-type hippocampal cells to tetanic stimulation;

comparing the effect of said agent on said mutant and said wild-type hippocampal cells upon tetanic stimulation; wherein a reduction in the enhanced synaptic potentiation of the mutant

hippocampal cells without a significant change in the synaptic potentiation of the wild-type cells is indicative of activity of a candidate drug for the treatment of Alzheimer's disease.

- 10. Slices of mouse hippocampal cells having a mutation in a presentilin gene combined with a candidate drug.
- 11. Slices of mouse hippocampal cells according to Claim 10, after tetanic stimulation.
- 25 12. Slices of mouse hippocampal cells according to Claim 10, wherein said mutation is the PS-1 Δ9 mutation.

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